Mr Simon Fawcett – Written evidence (OMC0058)

Off Site Manufacture (OSM) in Construction

Perceived advantages

1. *What are the opportunities offered by offsite manufacture for construction? What are the likely drawbacks? What factors are likely to influence clients, architects, design engineers, contractors and the supply chain in deciding whether to choose offsite manufacture?*

No one should assume that the construction industry in UK does not already use Off-Site manufacture (OSM). The strength of the pre-cast concrete beam and pre-fabricated timber roof-truss (to name but two) industries in UK shows that this is already happening, but more can be done.

The major opportunities lie anywhere that is amenable to standardisation. Tower blocks are likely to be suitable because their regular floor plan should offer opportunities to standardise the units that comprise the rooms – and especially more complex rooms like bathrooms and kitchens. However low rise construction can also benefit because careful design offers opportunities to combine 'modules' in different ways to produce houses with common features, but which make better use of the site layout.

Factors that improve the chances of people choosing to use OSM include experience, communications (understanding) and availability but most of all cost. Any contractor given a proper choice between methods will choose the cheapest. However off-site manufacture will not automatically happen if the architect has not considered possibilities for prefabrication in his design.

Factors that work against OSM include the division of labour and contract timing. Where an architect is appointed by a client or local authority without any responsibility for actual construction he is likely to omit aspects that favour OSM. If he is appointed directly by the builder or contractor in a "Design and Build" relationship, that will automatically produce pressures that favour OSM.

Other factors that might help include favourable planning or tax treatment for OSM projects. We probably have to acknowledge that the market has produced as much OSM as it's ever likely to under current constraints. However if additional incentives (including competitions) from local authorities or Development Corporations were available they would shift the balance towards longer term relationships, and more extensive appointments that can support private investment and facilitate OSM.

This might lead to an OSM 'grading' scheme similar to that for energy efficiency appearing with more favourable treatment being given to those schemes with a higher OSM component.

Drawbacks to OSM. Drawbacks are usually the other side of the standardisation coin. Standardisation can produce awful 'soviet' style blocks that are ugly to look at and where nobody wants to live. Most people who have the chance to choose where they live will be interested in what it's like to live there. This problem can be solved while still allowing for standardisation by experienced architects working for a builder who are sufficiently skilled and imaginative in their designs.

2. *It is often claimed that offsite manufacture can lead to: • lower costs, faster delivery and increased quality; • increased productivity; • improved health and safety; • greater provision of new, affordable housing. What is the evidence for this?*

As above, the relevance and suitability of Off-site manufacture will depend on the project objectives. It will not be suitable for every project, but where demand for housing and speed dominate it is likely to excel.

An excellent example of off-site manufacture for accelerated housing construction are some of the tower blocks recently erected in China. An article in the Guardian in 2015 describes how a Chinese construction firm (Broad Sustainable Building) was able to erect a 57 storey skyscraper in just 19 days. It provides 800 apartments and office space for up to 4000 people. Other examples are appearing.

Of course this was preceded by years of meticulous planning and design and months of intensive pre-fabrication of more than 2700 modules. But it shows that it can be achieved.

Lower Costs: A considerable proportion of construction costs goes into simply maintaining the construction site itself so any reduction in the time this is required significantly reduces costs.

Increased quality: The modules are usually built in a relatively controlled 'factory' environment where workers are sheltered from bad weather and warm with access available at ground level. This compares with more traditional methods where workers would be subject to the weather over many months at height on a skyscraper which is accessible only via temporary elevators. Conditions for doing the work and inspecting it for quality control in the 'factory' environment mean that the product is likely to be of much superior quality to that provided traditionally.

Improved Health and Safety: A similar argument to that above applies. Where access is good, communications are good and workers are not subject the worst of the weather, they are likely to make fewer mistakes and be safer.

Potential Barriers

3. *Drawbacks*. Drawbacks are described under 1 above.

4. *What re-skilling of the construction workforce is required to facilitate a change to more off-site manufacture for construction?*

It is probably not correct to put re-skilling of the workforce before the basic contractual incentives described above. If the financial incentives are there, the industry will re-skill by itself. If any re-skilling is required it is possibly in the building and procurement departments of major clients and local authorities who need to understand and leverage the influence they hold over the way their projects are built.

OSM is likely to lead to greater demand for high technology skills associated with machine control and automation for the 'factory' environments that will be needed. In that sense the UK will need to produce more technicians with these skills. Current efforts for the UTC's to develop their offering need to be encouraged and amplified otherwise the current deficit in traditional building skills will simply be replaced by a similar deficit in higher technology skills.

5. *Can the benefits of standardisation and factory manufacture be realised without hampering architectural ambition? If so, how?*

As indicated above there are some architects and designers who can manage both standardization and architectural ambition. However these features may not always be on the same project. Clients who want bespoke buildings will pay for them. Clients under stronger pressures for lower costs and faster delivery will work out ways of incentivizing their delivery teams to suit.

6. *What R&D is needed, and by whom, to realise fully the potential benefits of off-site manufacture?*

One of the problems associated with trying to make OSM adoption more widespread is the current gap in design data standardization. This is somewhat similar to the problem experienced when comparing products from different manufacturers. Their brochures and catalogues describe their products in English but except where a parameter (eg thermal efficiency) is covered by a given standard they often use different terminology. If it includes a 'performance table' they will list different parameters. Thus it's quite hard to know how they really compare. Building Information Modelling (BIM) is a technology that is gradually making its mark on the industry and will help this, but slowly. It's a step in the right direction and needs to be encouraged, but unfortunately even the current BIM initiative doesn't go far enough to really nail this problem down to the point where the selection, production and delivery of material components in a building can be fully automated. Currently this is still a very manual activity (in the design office). Suppliers and manufacturers are doing their bit, but (understandably) are generally focused on their own commercial advantage. Data standards do exist in many areas but are not widely adopted. So commercial interests, ignorance and lack of understanding of the need currently hamper a UK wide initiative here.

This is not a small problem. The work required to achieve this objective across the whole UK Construction industry supply chain is worth studying by a combined team comprising persons drawn from:

- Architects with experience of OSM
- Major building component suppliers
- Major MEP (mechanical, electrical, process) suppliers and designers
- A university with a track record in this kind of activity and especially data management
- A major design-build contractor

The study should be led by one of the building institutions eg CIOB.

26 April 2018